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HAKUBI RESEARCHERS' ACTIVITIES IN ICR

Hakubi Project: Fosterage and Support of Young Researchers, Kyoto University

Research Topic

Algorithmic Graph Theory with Applications to Bioinformatics

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(Ph D)

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Outline of Research

During 2015, I have worked on several research topics involving graph algorithms, data compression, and bioinformatics together with researchers in Japan, Singapore, and Sweden. One project introduced four graph orientation problems that we call “Max W-Light”, “Min W-Light”, “Max W-Heavy”, and “Min W-Heavy”, where W can be any fixed non-negative integer. In each of these four problems, the input is an undirected, unweighted graph and the objective is to assign a direction to every edge so that the number of vertices with outdegree at most W or at least W in the resulting directed graph is maximized or minimized. A number of results on the computational complexity and polynomial-time approximability of these problems for different values of W and various classes of graphs were derived. In particular, we observed that the special cases Max 0-Light and Min 1-Heavy are identical to the well-known Maximum Independent Set and Minimum Vertex Cover problems, respectively, so by allowing the value of W to vary, we obtained a new, natural generalization of the two latter problems.